

Appl. No. 10/628,085
Amdt. Dated September 4th, 2007
Reply to Office Action of June 1, 2007

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REMARKS

This is a full and timely response to the non-final Office action mailed June 1, 2007. Reexamination and reconsideration in view of the foregoing amendments and following remarks is respectfully solicited.

Specification Objections

In the office action, the Examiner objected to the amendment filed 2/27/07 under 35 U.S.C 132(a) because it introduces new matter into the disclosure. Specifically, the Examiner stated that previously made amendments (made at the suggestion of the Examiner) added new matter. Applicants strenuously disagree, and note that both the terms "residual" and "residual difference" were included in the specification as filed.

However, in an effort to further prosecution, the above amendments to the specification cancel the previously made amendments to the specification. Thus, applicants submit that this rejection is overcome, although in no way should this action be construed as acquiescence to the propriety of the rejection.

Rejections Under 35 U.S.C. § 112

In the office action, claims 5-7, 9-11, 33, 34 and 36-38 were rejected under 35 U.S.C. § 112. Specifically, the Examiner objected to the phrase "a selected maximum safe exhaust temperature for the turbine engine" in amended claim 11 as new matter. Although applicants again disagree with the substance of the Examiner's rejection, applicants have amended claim 11 to remove the term "selected". Applicants note that the claim as filed included the phrase "maximum safe temperature, and further note that paragraph 36 describes in detail exhaust gas temperature (EGT) margin for a turbine engine. Thus, the amended phrase of "maximum safe exhaust gas temperature for the turbine engine" clearly is not new matter.

The Examiner also objected to the phrase "a computing processor" in claim 31 as new matter. Applicants again disagree, but have amended the claim 31 to remove the term "computing" as was suggested by the Examiner.

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In the office action, claims 1, 5-7, 9-11, 31, 33, 34 and 36-38 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Specifically, with regard to claim 1, the Examiner cites the use of the word "residuals" and the phrase "residual difference", stating that there is a conflict between the claimed "residual" and the disclosed "residual difference" in the specification. Applicants respectfully disagree.

First, applicants note that the term "residual" can be used as both a **noun** and an **adjective**. Specifically, the term "residual" used by itself is a **noun** commonly defined as the difference between obtained results. Likewise, the phrase "residual difference" uses residual as an **adjective** modifying difference, where the adjective usage of residual is commonly defined as relating to a residue. See for example, Merriam-Websters Collegiate Dictionary, Eleventh Edition (2003), page 1060, a copy of which is attached.

Second, applicants submit that, contrary to the Examiner's assertions, the noun form of "residual" was used repeatedly in the specification. See for example, paragraphs 0008, 0021 and 0024.

Third, the cited usage of the terms "residuals" and "residual difference" in paragraph 0024 is perfectly consistent. The cited sentence of paragraph 0024 is as follows:

Generating **residuals** can be accomplished using a variety of techniques, such as by comparing the sensor data to expected values and determining the **residual difference**.
(emphasis added).

In this sentence, the recitation of the term "residuals" is uses the noun form the word. Conversely, the recitation of the term "residual" in the phrase "residual difference" uses the adjective form the word, modifying the word "difference".

As stated above, the noun form is commonly defined as the difference between obtained results. This is perfectly consistent with the phrase that follows of "comparing the sensor data to expected values". Likewise, the adjective form is commonly defined as relating to a residue. Thus, describing the "difference" as relating to a residue of

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compared sensor data to expected values is completely consistent with the noun form of "residual". Thus, there is no contradiction between the use of the term "residual" as a noun, or the use of the term "residual" as an adjective in the phrase "residual difference".

Thus, there is no basis for the Examiners rejection under 35 U.S.C. § 112, first paragraph based on the applicants usage of residual and residual difference. Applicants thus submit that the rejection should be withdrawn.

The Examiner further objected to the phrase "determining a rate of change of residuals", asking "how and in what manner is 'rate of change' determined, what criteria is used?". Applicants again disagree, and first note that the term "rate of change" is notoriously well known in a general mathematical sense. Furthermore, paragraphs 0032 and 0033 describe how a "slope calculator" can be used to determine the rate of change using a linear fit of N samples of filtered data. Given such a description, one of ordinary skill in the art would certainly understand how to calculate the rate of change of sensor data. Applicants thus submit that this rejection should be withdrawn.

With regard to the "selected", applicants have removed that phrase as suggested by the Examiner.

With regard to "margin", the Examiner states that it is unclear in what manner "a margin" related to "augment the sensor data". Applicants again disagree, and submit that the relationship is sufficiently clear. Specifically, applicants note that the specification repeatedly describes calculating a margin as one technique that can be used to augment the sensor data. See paragraph 0024 as one example, which states "The residual data can be augmented using a variety of techniques, such as by determining the rate of change of residual data or determining margin levels". Also note that this relationship was defined in the claims. See claims 5 and 14 as two examples.

Next, the Examiner alleges that the computer components (i.e., the sensor data processor, computing processor and fuzzy logic inference system) are essentially black box with no description of the internals. Applicants again disagree. With regard to the sensor data processor applicants note that FIG. 3 and the corresponding description illustrates an embodiment of the sensor data processor that includes residuals generators,

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residual filters, slope calculators and slope filters. This is described in great detail in paragraphs 0025 to paragraphs 0039. Likewise, the fuzzy logic inference system is described and illustrated in FIG. 4, and shown to include a rule applier, rule aggregator and an output generator. This is described in great detail in paragraphs 0041 to 0055. Likewise, the processor is described in paragraph 0067. Furthermore, specific mathematical techniques that can be used are described. See paragraph 0051 that describes the use of a Fuzzy Logic Toolbox available in MatLab. Thus, the allegation that these elements are merely "black boxes" for purposes of enablement is completely without merit. Applicants thus request that this rejection likewise be withdrawn.

In the office action, claims 1, 5-7, 9-11, 31, 33, 34 and 36-38 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. With regard to claims 1 and 31, the Examiner stated that it was not clear what is meant by the term "data type" and the term "likelihood". Applicants respectfully disagree, and submit that these terms are appropriately clear. Specifically, the term "data type" simply means a type of data. Examples of types of data for which membership functions can be created are described in detail in applicant's specification. See paragraphs 0053-0055 which give several different examples. Likewise, the usage of the term "likelihood" merely follows the accepted definition of the term, e.g., a probability. Thus, the phrase "determine a likelihood that a fault has occurred in the turbine engine" means that a probability (by any measure) that a fault has occurred is determined.

With regard to claims 11 and 34, the Examiner stated that it was not clear what all is meant and encompassed by a "maximum safe temperature", alleging that the term "maximum safe" is indefinite in the claim, and the scope of the claim is uncertain. Applicants disagree, and submit that the scope of the claim is clear when properly interpreted in light of the specification. Specifically, the specification at paragraph 0036 specifically describes one method of the EGT margin being calculated. This example states that the EGT margin represents the number of degrees between the current operating conditions and the "temperature redline for that particular engine model",

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where the engine's redline is generally a "safety limit on temperature for the engine's operation". Thus, the maximum safe temperature is simply a temperature limit set for the operation of the turbine engine, above which the safety of the engine could be comprised. Taken in this context, the use of the term "maximum" clearly is well defined and meets the requirements under section 112. Thus, applicants submit that this rejection has been overcome.

With regard to claim 31, the Examiner stated that the applicant recites "processor" and a "sensor data processor", and that there is no distinction between the processors in the claim. The Examiner also stated that the "sensor data processor" will be interpreted as a "sensor data processing program". Accordingly, applicants have amended claim 31 as suggested by the Examiner. Specifically, applicants have amended claim 31 to recite "sensor data processing program" in lieu of sensor data processor. Applicants note that the support for this interpretation is found in FIG. 12 and paragraphs 0066 to 0072, which describe the invention as a functioning system with processor, memory, and a fault detection program residing in memory and being executed by the processor.

Applicants thus submit that this rejection has been overcome.

Rejections Under 35 U.S.C. § 102 and 103

Claims 1, 5-7, 9-11, 31, 34 and 36-38 were rejected under 35 U.S.C. § 102 as allegedly being anticipated by U.S. Patent Publication No. 2003/0139860 to McBrien et al, hereinafter McBrien. The Examiner stated that McBrien discloses a fault detection system for detecting faults in a turbine engine, where the fault detection system includes a sensor data processor providing an augmented data set and a logic inference system, the logic inference system analyzing the augmented data set to determine the likelihood that a fault has occurred.

In making these rejections, the Examiner cited elements 14 and 16 of FIG. 3 as disclosing a sensor data processor, and element 30 of FIG. 3 as disclosing a fuzzy logic inference system. Applicants respectfully disagree, and submit that the claims are patentably distinct over the cited McBrien reference.

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First, with regard to the sensor data processor, the Examiner alleged that elements 14 and 16 of McBrien constitute the recited sensor data processor, stating that these elements are configured to augment the sensor data by generating residuals and determining a rate of change of the residuals. Specifically, the Examiner cites the McBrien as teaching a rate of change of the residuals in the form of a "horsepower deviation rate". See page 7 of the office action dated June 1, 2007.

Applicants submit that this is a misreading of the reference. First, applicants note that McBrien does not disclose a "deviation rate" but instead discloses a "deviation ratio". (emphasis added). The words "deviation rate" are not found in McBrien. In fact, the cited paragraph 0057 of McBrien clearly describes that the "deviation ratios" are calculated through division, which is consistent with the calculation of a ratio. See the equation in paragraph 0057. Applicants can thus find no teaching in McBrien where the **rate of change of sensor data residuals** is calculated. Applicants thus submit that this part of the rejection is based on a misinterpretation of McBrien, and that the reference fails to teach the recited limitations.

Second, with regard to the fuzzy logic inference system, the Examiner alleged that element 30 of McBrien constituted this element. Applicants again disagree, and submit that element 30 of McBrien does not include any sort of fuzzy logic inference system as claimed. While FIG. 3 of McBrien does label element 30 using the phrase "fuzzy logic calculations", it is merely described as performing calculations relating to bypass, stopping or enabling the fault detection system. See FIG. 4 and paragraphs 0046-0048 of McBrien. For example, these sections describe how the element 30 determines if there are sufficient sensors available, and if not the fault detection logic is bypassed. Additionally, element 30 is described as determining the engine operating mode and likewise bypasses the fault detection logic if the engine is not in normal or combat roles. See paragraph 0047 of McBrien.

In contrast, applicants independent claims recite that the fuzzy logic inference system includes a plurality of membership functions and is configured to fuzzyify the augmented data set using the plurality of membership functions, and determine a

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likelihood that a fault as occurred in the turbine engine. Applicants can find no teaching of any membership functions or the use membership functions to determine a likelihood that a fault has occurred with regard to element 30. Applicants note that the Examiner did not cite any particular portion of McBrien as teaching membership functions.

As McBrien fails to teach a sensor data processor or fuzzy logic inference system as claimed, applicants submit that independent claim 1 is patentably distinct over McBrien. Furthermore, as claims 5, 6, 7, 9, 10 and 11 depend from, and include all the limitations of independent claim 1, they are also submitted to be patentably distinct.

Claims 31, 33, 34, 36-38 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over McBrien in view of Martucci (U.S. Patent No. 6289274). Applicants again disagree, and submit that independent claim 31 is patentably distinct over the cited references for similar reasons as was expressed with respect to claim 1. Specifically, the Martucci reference was simply cited as teaching a processor, and the reference thus does not overcome the deficiencies in McBrien noted above. Furthermore, as claims 33, 34 and 36-38 depend from, and include all the limitations of claim 31, they are also submitted to be patentably distinct.

Conclusion

Based on the above, independent Claims 1 and 31 are patentable over the citations of record. The dependent claims are also submitted to be patentable for the reasons given above with respect to the independent claims and because each recite features which are patentable in its own right. Individual consideration of the dependent claims is respectfully solicited. New claims 39-43 are likewise submitted to be patentably distinct for similar reasons to those given above, and for other features patentable in their right.

The other art of record is also not understood to disclose or suggest the inventive concept of the present invention as defined by the claims.

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Hence, Applicant submits that the present application is in condition for allowance. Favorable reconsideration and withdrawal of the objections and rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

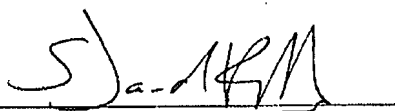
If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the below-listed number.

If for some reason Applicant has not paid a sufficient fee for this response, please consider this as authorization to charge Ingrassia, Fisher & Lorenz, Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

INGRASSIA FISHER & LORENZ

Dated: 4 Sept 2007

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Merriam- Webster's Collegiate[®] Dictionary

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resh 'vrášh\ n (Heb *rësh*) (ca. 1823) : the 20th letter of the Hebrew alphabet — see ALPHABET and table

re-shape 'v(ə)-'shəp\ vb (1827) : to give a new form or orientation to
— REORGANIZE — re-shape-er

re-shuffle 'v(ə)-'shə-fəl\ vb (1830) 1 : to shuffle (as cards) again 2 : to reorganize
re-shuffle 'v(ə)-'shə-fəl\ vb (1830) 1 : to redistribute of existing elements (the cabinet was reshuffled by the prime minister) — reshuffle *n*

re-sid 'r(ə)-z(ə)d\ n (1967) : RESIDUAL OIL

re-side 'r(ə)-z(ə)d\ v re-sid-ed; re-sid-ing [ME, fr. MF or FL *MF residere*, fr. L *residere* to sit back, remain, abide, fr. *re- + sedere* to sit — more at *sit*] (15c) 1 a : to be in residence as the incumbent of a benefice or office b : to dwell permanently or continuously ; occupy a place as one's legal domicile 2 a : to be present as an element or quality b : to be vested as a right — re-sid-er *adj*

res-idence 'V(ə)-z(ə)d\ (s, 'rez-dən(t)s, 're-z(ə)-den(t)s n (14c) 1 a : the act or fact of dwelling in a place for some time b : the act or fact of living or requiring the payment of a benefit 2 a (1) : the place where one actually lives as distinguished from one's domicile or a place of temporary sojourn (2) : DOMICILE 2a b : the place where a corporation is actually or officially established c : the status of a legal resident 3 a : a building used as a home ; DWELLING b : housing or a unit of housing provided for students 4 a : the period or duration of abode in a place b : a period of active and esp. full-time study, research, or teaching at a college or university — in residence : engaged to live and work at a particular place often for a specified time (poet in residence at a university)

res-idence time *n* (1954) : the duration of persistence of a mass or substance in a medium or place (as the atmosphere)

res-iden-cy 'V(ə)-z(ə)d\ (t)-sē, 'rez-dən(t)-\ n, pl -cies (1579) 1 a : a usu. official place of residence b : a state or period of residence (a 20-year ~ in the city); also RESIDENCE 2c 2 : a territory in a protected state in which the powers of the protecting state are executed by a resident agent 3 a : a period of advanced training in a medical specialty that normally follows graduation from medical school and licensing in a specialty of medicine b : RESIDENCE 4b c : a period of residence as an artist

¹res-ident 'V(ə)-z(ə)d\, 'rez-dənt, 'r(ə)-z(ə)-dənt *adj* [ME, fr. AF, fr. L *resident-, residens*, prp. of *residere*] (14c) 1 a : living in a place for some length of time : RESIDING b : serving in a regular or full-time capacity (the ~ engineer for a highway department); also : being in residence 2 : PRESENT, INHERENT 3 : not migratory

²resident *n* (15c) 1 : one who resides in a place 2 : a diplomatic agent residing at a foreign court or seat of government; esp : one exercising authority in a particular country 3 : a representative of the protecting power 4 : a physician serving a residency

resident commissioner *n* (1902) 1 : a nonvoting representative of a dependency in the U.S. House of Representatives 2 : a resident administrator in a British colony or possession

res-iden-tial 'V(ə)-z(ə)d\ (t)-shəl, 'rez-dən(t)-\ *adj* (1654) 1 a : used as a residence or by residents b : providing living accommodations for students (a ~ prep school) 2 : restricted to or occupied by residents (a ~ neighborhood) 3 : of or pertaining to residence or residences 4 : provided to patients residing in a facility (a ~ drug treatment); also : being for patients receiving such treatment (a ~ treatment center) — res-iden-tial-ly 'v-dən(t)-sh(ə)-li *adv*

res-iden-tial college *n* (1991) : COLLEGE 3a

re-sid-u-al 'r(ə)-z(ə)-wəl, -jəl, -z(ə)-wəl *n* [L *residuum* residue] (1557) 1 : REMAINDER, RESIDUUM; as a : the difference between results obtained by observation and by computation from a formula or between the mean of several observations and any one of them b : a residual product or substance c : an internal state (a ~ effect of experience or activity that influences later behavior) esp : a disability remaining from a disease or condition 2 : a payment (as to an actor or writer) for each rerun after an initial showing (as of a TV show)

²residual *adj* (1570) 1 : of, relating to, or constituting a residue 2 : leaving a residue that remains effective for some time (a ~ pesticide) — re-sid-u-al-ly *adv*

residual oil *n* (ca. 1948) : fuel oil that remains after the removal of valuable distillates (as gasoline) from petroleum and that is used esp. by industry — called also *resid*

residual power (1819) : authority held to remain at the disposal of a governing authority after an enumeration or delegation of specified powers to other authorities

re-sid-u-ary 'r(ə)-z(ə)-w(ə)-r-ē *adj* (1726) : of, relating to, or constituting a residue (an ~ estate)

res-idu-ous 'V(ə)-z(ə)-dū-, -dyū\ *n* [ME, fr. AF *residuus*, fr. L *residuus*, fr. neut. of *residuus* left over, fr. *residere* to remain] (14c) : something that remains after a part is taken, separated, or designated or after the completion of a process : REMNANT, REMAINDER; as a : the part of a testator's estate remaining after the payment of all debts, charges, allowances, and various expenses and bequests b : the remainder after subtracting a multiple of a modulus from an integer or a power of the integer that can appear as the second of the two terms in an appropriate congruence (2 and 7 are ~s of 12 modulo 5) c : a constituent structural unit (as a group or monomer) of a usu. complex molecule (amino acid ~s from hydrolysis of protein)

residue class *n* (1948) : the set of elements (as integers) that leave the same remainder when divided by a given modulus

re-sid-u-um 'r(ə)-z(ə)-wəm\ *n*, pl re-sid-u-ū 'w(ə)-l [L] (1672) : something residual; as a : RESIDUE a b : a residual product (as from the distillation of petroleum)

re-sign 'r(ə)-z(ə)-z(ə)n\ vb [ME, fr. AF *resigner*, fr. L *resignare*, lit., to unseal, cancel, fr. *re- + signare* to sign, seal — more at *SIGN*] v (14c) 1 : REBEGATE, CONSIGN; esp : to give (oneself) over without resistance (a ~ed himself to her fate) 2 : to give up deliberately; esp : to renounce (a ~ed his office) 3 : to give up or resign (a ~ed his office or position) by a formal act 4 : to give up or resign (a ~ed his office or position) : QUIT 2 : to accept something as inevitable : SUBMIT *syn* see *RELINQUISH* *re-sig-ned-ly* 'z(ə)-z(ə)-n-ē *adv* — re-sig-n-er 'r(ə)-z(ə)-z(ə)n-ər *n* — re-sig-n-ment 'z(ə)-z(ə)-n-mənt *n* — re-sig-n 'v(ə)-z(ə)-z(ə)n\ v (1805) : to sign again; esp : to rehire (as an athlete) by means of a signed contract — *vi* : to sign up again

[illegible]